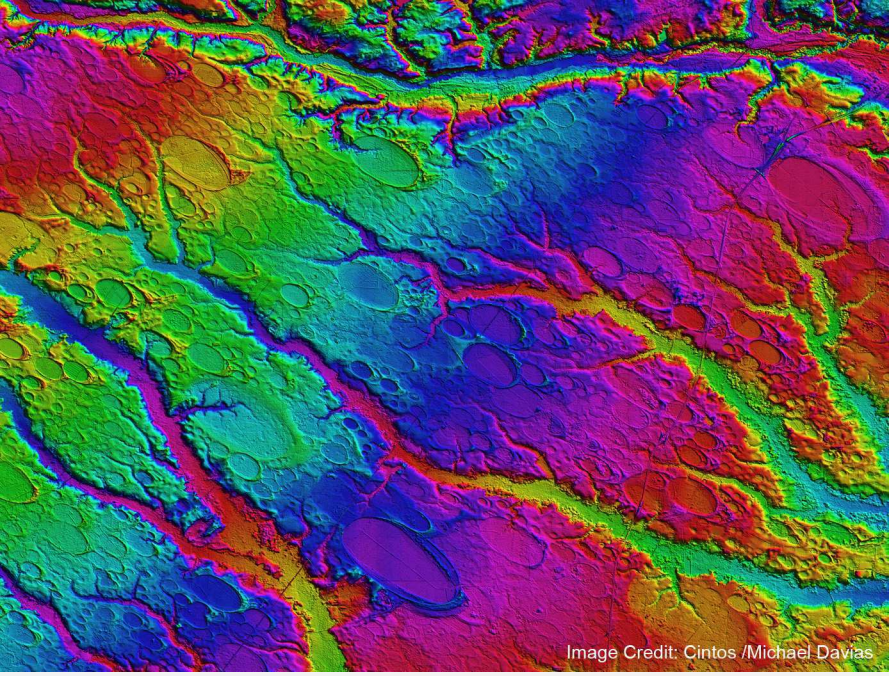

Image Credit: Cintos /Michael Davias

National Aeronautics and Space Administration

Optics

Lidar, Radar, and Sonar Processing Method

Processing method utilizing multiple closely spaced orthogonal carriers modulated by PN codes using Binary Phase Shift Keying (BPSK) modulation

NASA Langley Research Center has developed a novel method to process lidar ranging and differential absorption measurement data. The technique uses multiple closely spaced orthogonal carriers modulated by PN codes using BPSK modulation. The flight tested innovation reduces errors and provides higher resolution than comparable methods. While developed for lidar, the method can be used in radar, sonar or any similar modality based on processing of repeating waveforms.

BENEFITS

- Provides a more efficient and accurate method of modulating sine waves for differential absorption measurements
- Allows simultaneous measurements with continuous wave lasers instead of sequential measurements using pulsed lasers

APPLICATIONS

- Differential absorption measurements, including determining the concentration of CO2 in the atmosphere
- Range finding and mapping

technology solution

THE TECHNOLOGY

The technology is a method of processing lidar ranging and differential absorption measurement data that incorporates pseudo noise (PN) codes to modulate a sine wave carrier. The method achieves orthogonality by making the carriers themselves orthogonal. Use of orthogonal channels allows performing a number of measurements simultaneously using continuous wave (CW) rather than the conventional sequential measurements with the more costly, error-prone, bulky and complex pulsed lasers. Performing simultaneous measurements is more compatible with dynamic conditions such as those found in aircraft and satellites.

The technology was developed in support of the ASCENDS mission, which is to make CO2 column mixing ratio measurements during day and night over all latitudes and all seasons and in the presence of thin or scattered clouds.

PUBLICATIONS

Patent Pending

Joel F. Campbell, Bing Lin, Amin R. Nehrir, F. Wallace Harrison, and Michael D. Obland, "Binary phase shift keying on orthogonal carriers for multi-channel CO2 absorption measurements in the presence of thin clouds," Opt. Express 22, A1634-A1640 (2014)

More Information

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NP-2015-08-2064-HQ

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LAR-18539-1